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TITLE: COMPOSITION FOR POLISHING

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ABSTRACT:

PROBLEM TO BE SOLVED: To obtain a polishing composition which has an excellent polishing performance, is suitable for flattening the surfaces of wafers for semiconductor devices, and consists mainly of Al₂O₃/SiO₂ compound particles.

SOLUTION: The composition for polishing comprises deionized water, an additive and metal oxide particles consisting essentially of the Al₂O₃/SiO₂ compound.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the chemical mechanical abrasive compound of the semiconductor device composed from the constituent for polish, the metallic-oxide impalpable powder which uses $2O_3/SiO_2$ of aluminum complex as an indispensable component in more detail, deionized water, and the additive.

[0002]

[Description of the Prior Art] in recent years, the degree of integration of an integrated circuit (IC) increases -- alike -- following -- the importance of global (Global) flattening of a wafer -- steps -- it is large and it is the chemical mechanical polish (Chemical Mechanical Polishing; CMP) which began to capture the spotlight as such new flattening technology. A high integrated-semiconductor element is manufactured by repeating and carrying out the vacuum evaporation of conductor material and the insulator material, and making a pattern form. If flattening of the front face is not carried out when making a pattern form, many difficulties will be received for making it form a new pattern layer. Feature size (Feature Size) needs minimum-sizing and multilayer connecting (Multilevel Interconnection), and one of the minimum conditions for it is global flattening as a degree of integration increases.

[0003] Although the metal layer has a three-tiered structure when structures, such as a microprocessor or RAM, are the three-generation versions of steps multilayer structure, for example, 64DRAMs, between membrane layers is in the state which is not uniform, and when piling up continuously, there is room for the problem on process advance to occur for the complexity on structure. That is, if an incident ray is reflected irregularly by the refracted membranous quality which is not flat at the time of a photograph process, thereby, the problem to which a photoresist pattern does not become exact may occur at the time of development. Therefore, it will be necessary to constitute the structure between these membranous qualities more simply, and a membranous unnecessary growing region is removed and it is made for more membranous quality to pile up efficiently for this reason. The most efficient thing in the flattening process known till present is CMP. Moreover, since the process of the new flattening processes (SOG Etch Back/efficient consumer response Depo & Etch etc.) developed until now is complicated, it receives going on two to 5 step, and a CMP process can merely end a process by polish and washing once. The constituent for polish used for a semiconductor CMP process usually contains the metallic oxide in common, and can divide it roughly into three sorts by the quality of abrasives-ed like [for the object for single-crystal-silicon polish, the object for insulating-layer polish, metal wiring, and plug polish].

[0004] As the metallic oxide used for a semiconductor CMP process The silica manufactured by the fuming method or the sol gel (Sol-Gel) method (SiO_2), An alumina (aluminum $2O_3$), Seria (CeO_2), a zirconia (ZrO_2), The titania (TiO_2) etc. is used most widely (USP4,959,113, USP5,354,490, USP5,516,346, and WO 97-40,030). Recently, the constituent which used MANGANIA ($Mn 2O_3$, EP 816,457), silicon nitride (SiN , EP786,504), etc. is also reported. These methods will express the property which changes in the physical properties and polish performance of a slurry, respectively with kinds of selected metallic oxide about the method which used the metallic oxide in independent, respectively. For example, since the particle itself is soft in a polish performance though it has a comparatively unstable distributed state when applying to acid conditions in the case of the slurry which used the silica, it is mu. - Although it has the advantage which does not make a scratch induce, when applying by the metal slurry, it has the fault that the polish speed to barrier material (Barrier material) is slow. On the other hand, when an alumina is used as a metallic oxide, and the stable distributed state is expressed compared with the silica under acid conditions and it applies by the metal slurry, while there is an advantage with an excellent polish speed to barrier material, the fault which makes many defects, such as mu-scratch, induce is after polish.

[0005] Although the slurry which used metallic oxides, such as Seria announced recently, a zirconia, a titania, MANGANIA, and silicon nitride, expresses the result improved how much in respect of physical properties and a polish performance, the commercial manufacturing process of these metallic oxides has not turned stably [**] yet, and the expensive point is pointed out as a fault compared with the silica and the alumina also in the price.

[0006] Moreover, the method of improving a polish performance is also learned for two or more sorts using the aforementioned metallic oxide, mixing. For example, there are a method (USP 5,084,071) of raising polish repeatability, the method (WO 97/13889) of making an alumina (alpha type) the main abrasive material, and carrying out optimum dose addition of the soft metallic oxide more relatively than an alumina, etc. by making a silica into the main abrasive material and carrying out little addition of the aluminum $2O_3$. Although the result improved with polish speed, polish selectivity, etc. from the case where the

slurry manufactured by these mixture method uses a single metallic oxide is expressed, it can be said that the room of an improvement remains. For example, since these particles exist with the only mixed gestalt when adding a small amount of silica to the slurry which made the alumina (alpha type) the main abrasive material, the distributed stability of a slurry falls and the precipitation (Sedimentation) reduction by the solidification (Coagulation) between particles etc. takes place during storage. [0007]

[Problem(s) to be Solved by the Invention] This invention persons improve the above conventional troubles, and in order to obtain an excellent abrasive compound, as a result of repeating research and development, the final draft of this invention will be carried out. That is, the constituent for polish which made the principal component the $2\text{O}_3/\text{SiO}_2$ complex impalpable powder of aluminum with new this invention persons will find the fact of having an excellent polish performance, and will complete this invention.

[0008]

[Means for Solving the Problem] Since the purport of this invention has the property of excelling in polish speed, excelling in the polish selectivity by the kind of ground membranous quality, and not producing defects, such as mu-scratch, on a polish front face after polish when such a constituent is applied to polish of a semiconductor wafer about the abrasive compound characterized by what aluminum $2\text{O}_3/\text{SiO}_2$ impalpable powder contained in deionized water, it is applicable to manufacture of a high accumulation device.

[0009]

[Embodiments of the Invention] this invention relates to the abrasive compound suitable for surface flattening processing of a device wafer especially in semiconductor industry about the abrasive compound used for polish of various industrial products, such as a semiconductor, a photo mask, a glass disk, and synthetic resin. It is a thing about the constituent of slurries for polish, such as single crystal silicon with which CMP technology is applied, a layer insulation film, metal wiring and a plug, and barrier material, in more detail at the time of manufacture of a semiconductor device. Since it excels in polish speed, and it excels in the polish selectivity to each ground membranous quality compared with the existing abrasive compound and mu-scratch is not produced on the surface of a wafer after polish, the constituent for polish applicable to high accumulation device formation technology is offered. That is, it is offering the constituent for polish composed from the metallic-oxide impalpable powder, the deionized water, and the additive which use $2\text{O}_3/\text{SiO}_2$ of aluminum complex as an indispensable component, especially the constituent for chemical mechanical polish of a semiconductor device.

[0010] The metallic oxide used characteristic of this invention is manufactured by the Co-Fumed method which is the complex of aluminum $2\text{O}_3/\text{SiO}_2$ and uses AlCl_3 and SiCl_4 as a raw material as follows.

[0011]



Thus, aluminum $2\text{O}_3/\text{SiO}_2$ manufactured are the complex which is not the simple mixture gestalt of aluminum 2O_3 and SiO_2 , and the case where simple mixture of each component is carried out expresses completely different peculiar physical properties. The physical properties of aluminum $2\text{O}_3/\text{SiO}_2$ complex were arranged by Degussa (Germany) to the following table on the basis of "VP MOX 90" manufactured in the test-production article. < The physical properties of $2\text{O}_3/\text{SiO}_2$ of aluminum complex (test-production article VP MOX 90 criteria of Degussa (Germany))

[0012]

比表面積 (B E T)	$100 \pm 25 \text{ m}^2/\text{g}$
p H	> 3.8
Isoelectric Point	$6 \sim 7$
$\text{A l}_2\text{O}_3$ 含量	$67 \pm 15 \text{ wt\%}$
S i O_2 含量	$33 \pm 15 \text{ wt\%}$
容積密度 (Bulk density)	$60 \sim 100 \text{ g/l}$
塗素含量	$< 0.5 \text{ wt\%}$

The thing of the range whose $67 \pm 15 \text{ wt\%}$ and SiO_2 content the content of aluminum $2\text{O}_3/\text{SiO}_2$ which are a principal component can be adjusted by changing the amount and reaction condition of the raw material to throw in, and the content of aluminum 2O_3 is $33 \pm 15 \text{ wt\%}$ depending on the general Co-Fumed method is compounded, and the thing of this range is desirable to this invention.

[0013] The method of preparing the distributed liquid for using $2\text{O}_3/\text{SiO}_2$ of aluminum complex as a constituent for polish in this invention Although either of the existing distributed methods, such as the method of using the method and high shearing (High Shear) mixer which carry out high-speed stirring with dynamill or a ball mill, can also be used It is more effectively [than the case where the method (South Korean patent application KR-98-39212) using the principle of the micro fluidizer (Microfluidizer) by which was newly developed by this invention person and patent application was carried out is used] executable.

[0014] In this invention, 10-100nm of primary grain size of aluminum $2\text{O}_3/\text{SiO}_2$ for using it as distributed liquid for polish is

20-60nm preferably (result of BET measurement). It is not desirable, in order for difficulty to be in distribution, and for a large-sized particle to recognize abundant existence, although it is advantageous on the side of productivity, since polish speed increases and to carry out abundant induction of the mu-scratch, if too conversely as large [preferably] on the side of productivity as 100nm or more, since polish speed (Removal Rate) will fall, if a primary particle is too as small as 10nm or less. These distribution liquid has that desirable whose secondary average particle in a distributed state is 10-500nm, and since sedimentation will take place if distributed stability will fall if abundant content of the particle 500nm or more is carried out, and it is left at an one or more weekday room temperature and a stirring process is further needed before use of a CMP process, it is not desirable. On the other hand, in this invention, the particle size of aluminum $2\text{O}_3/\text{SiO}_2$ complex for using it as distributed liquid for polish can be written with specific surface area (Specific SurfaceArea:BET measurement), and is the range of 20-200m $^2/\text{m}$ preferably. In this invention, the solid concentration of $2\text{O}_3/\text{SiO}_2$ of aluminum complex which is the main abrasive material is usually 1 - 25 % of the weight preferably one to 50% of the weight to the constituent whole quantity. It is a book when solid concentration is less than 1 % of the weight. Although the desirable range is limited more by the property of ground membranous quality by such

→ within the limits Usually, the proper concentration in the case of applying the constituent which made the abrasive material $2\text{O}_3/\text{SiO}_2$ of aluminum complex as a slurry of the CMP process at the time of semiconductor-device manufacture When an abrasive material-ed is single crystal silicon, as for a layer insulation film, it is still more desirable that it is 1 - 5 % of the weight, and metal membranes, such as metal wiring / plug / [5 - 15 % of the weight and] barrier material, are 3 - 7 % of the weight.

[0015] In this invention, various additives are added and used for the distributed liquid for polish according to the quality of the material of ground membranous quality. For example, when adding and using bases, such as KOH, when using it for single crystal silicon and layer insulation film polish, and using it for barrier material polish, such as quality of a metal membrane, such as W or Cu, and Ti/TiN, and Ta/TaN, an oxidizer or other additives are added and used. The kinds of base which can be used for this invention are KOH, NH 4OH , R 4NCH_3 , etc., and the kinds of acid are H 3PO_4 , CH 3COOH , HCl, HF, etc. An oxidizer H 2O_2 , KIO 3 and HNO 3 , H 3PO_4 , K $2\text{Fe}(\text{CN})_6$, Na $2\text{Cr}_2\text{O}_7$, KOCl, They are OH, DMSO, etc. Fe (NO 3) 2 and NH 2 -- as other additives The potassium hydrogen phthalate for raising the polish selectivity between divalent acids, such as oxalic acid, a malonic acid, and a succinic acid, and the quality of a metal membrane (Potassium Hydrogen Phthalate), There is 2-pyrrolidine one which gives moistness and prevents a set and condensation, and these additives can be used by independent or mixture. Such addition sequence is not specified and can add aluminum $2\text{O}_3/\text{SiO}_2$ complex to deionized water at either before distribution and after distribution. As these additive dose was mentioned above, 1 - 5 % of the weight of $2\text{O}_3/\text{SiO}_2$ of aluminum complex, it is 1 - 10 % of the weight more preferably, and, therefore, the content of deionized water is 40 - 98 % of the weight in the amount of remainders.

[0016] this invention is a thing about the constituent for polish which used the new $2\text{O}_3/\text{SiO}_2$ complex impalpable powder of aluminum. If the constituent for polish manufactured by this invention is applied to polish of a semiconductor wafer Since polish speed is excellent and polish selectivity [especially as opposed to / have after polish the property of not causing mu-scratch result on a polish front face, and / a layer insulation film (SiO $_2$)] is excellent There is the feature which can be applied useful at the time of manufacture of a high accumulation device, such as having been suitable for the shallow trench isolation (Shallow Trench Isolation) process.

[0017] Hereafter, based on an example, this invention is explained concretely. The following example has an instantiation-meaning and does not restrict the protection range of this invention.

[Example]

→ 2O_3 <of manufactures aluminum of $2\text{O}_3/\text{SiO}_2$ complex distribution liquid of aluminum> SiO $_2$ complex powder (VP MOX 90, product made from Degussa) 1.3kg and the mixture of 8.6kg of deionized water are put into the polyethylene container of 20L After carrying out a premix (Premix) by 1000rpm for 2 hours and pressure throb was maintained by the range of 18,000**1,800psi using high-pressure distribution equipment, it was made to pass once and was made to distribute. After making the distributed sample filter with 5-micrometer depth filter (Depth filter), as a result of measuring a particle distribution and an average size using a grading-analysis machine (Zetasizer, product made from Malvern), the particle distribution was 10-400nm, and the average size was 180nm.

→ Make into an abrasive material what added the 20%-KOH solution suitably to $2\text{O}_3/\text{SiO}_2$ complex distribution liquid of aluminum 5L which carried out the example 1 aforementioned preparation, and adjusted pH to 11.0, and 6 inch wafer single crystal silicon (Si) is made into ground membranous quality. After grinding for 2 minutes under the following polish conditions, from change of the thickness removed by polish Polish speed and Within Wafer Non-Uniformity (WIWNU) were measured, and the occurrences of mu-scratch were measured using the KLA (product made from TENCOR) device.

<Polish condition> O grinder Model:6EC (product made from STRASBAUGH)

→ O polish condition: - pad type: -- IC1000/SubaIV Stacked (product made from Rodel)

- platen speed: -- 90rpm-quill (Quill) speed: -- 30rpm-pressure: -- 8psi-back pressure (Back Pressure): -- 0psi-temperature: -- 25 degree-C-slurry flow rate: -- 150 ml/minO polish result: [0018]

項目 \ 被研磨膜質	S 1
研磨速度 (Å/min)	4, 250
μ -スクラッチ発生 (個)	2
WIWNU (%)	2. 30

* In WIWNU=(standard deviation / average polish speed) × 100 example 2 example 1, the example 1 and this method estimated the polish performance as ground membranous quality except for having used a layer insulation film (SiO₂) and SiN instead of single crystal silicon, respectively.

O Polish result. [0019]

項目 \ 被研磨膜質	SiO ₂	SiN
研磨速度 (Å/min)	5, 775	345
μ-スクラッチ発生 (個)	0	0
WIWNU (%)	2.45	3.21

After adding deionized water 5L further to 2O₃/SiO₂ complex distribution liquid of example 3 aforementioned [aluminum] 5L, adjusting solid concentration to 6.5% of the weight and doing 0.4L addition of 50%-H₂O₂ as an oxidizer, H₂SO₄ and HNO₃ were added and pH was adjusted to 3. Each 6 inch wafer with which W and SiO₂ were applied was made into ground membranous quality, and the method of an example 1 estimated the polish performance.

O Polish result. [0020]

項目 \ 被研磨膜質	W	SiO ₂
研磨速度 (Å/min)	3,450	24
μ-スクラッチ発生 (個)	1	0
WIWNU (%)	3.45	2.3

as the oxidizer after adding deionized water 5L further to 2O₃/SiO₂ complex distribution liquid of example 4 aforementioned [aluminum] 5L and adjusting solid concentration to 6.5% of the weight -- 50%-H -- H₂ after doing 0.4L addition of 2O₂ -- pH was adjusted to 6.5 using SO₄, HNO₃, and ammonia The method of an example 1 estimated the polish performance by making into ground membranous quality each 6 inch wafer with which Cu and SiO₂ were applied.

O Polish result. [0021]

項目 \ 被研磨膜質	Cu	SiO ₂
研磨速度 (Å/min)	4,370	12
μ-スクラッチ発生 (個)	0	0
WIWNU (%)	2.35	2.10

Instead of the 2O₃/SiO₂ complex distribution liquid of aluminum, except for having manufactured and used distributed liquid by the same method as follows using the single metallic oxide, the slurry was manufactured by the same method as an example 1, and the polish performance was evaluated in one to example of comparison 3 example 1. O aluminum2O₃ distribution liquid: -- particle distribution; -- a 10-720nm, average; 255 nmOSiO₂ distribution liquid:particle distribution; 10-400nm, average; 175 nmOCeO₂ distribution liquid:particle distribution; 10-1100nm, and average; 450nmO polish result [0022]

試験\項目	金属酸化物 分散液	研磨速度 (Å/min)	μ-スクラッチ 発生 (個)	WIWNU (%)
比較例 1	Al ₂ O ₃	3,500	280	5.85
比較例 2	SiO ₂	1,340	16	5.10
比較例 3	CeO ₂	5,150	35	5.00

Instead of the 2O₃/SiO₂ complex distribution liquid of aluminum, except for having used the metallic-oxide distribution liquid of other components as follows, the slurry was manufactured by the same method as an example 2, and the polish performance was evaluated in four to example of comparison 6 example 2.

[0023]

試験\項目	被研磨膜質	金属酸化物 分散液	研磨速度 (Å/min)	μ-スクラッチ 発生 (個)	WIWNU (%)
比較例 4	SiO ₂	Al ₂ O ₃	5,315	370	4.45
			1,105	12	4.50
比較例 5	SiO ₂	SiN	3,980	39	3.90
			870	8	4.00
比較例 6	SiO ₂	CeO ₂	6,263	87	4.35
			410	5	4.10

Instead of the $2\text{O}_3/\text{SiO}_2$ complex distribution liquid of aluminum, except for having used the metallic-oxide distribution liquid of other components as follows, the slurry was manufactured by the same method as an example 3, and the polish performance was evaluated in seven to example of comparison 9 example 3.

[0024]

試験\項目	被研磨膜質	金属酸化物分散液	研磨速度(Å/min)	μ -スクラッチ発生(個)	W I W N U (%)
比較例 7	W_{SiO_2}	Al_2O_3	3, 104	178	4. 55
			650	58	3. 45
比較例 8	W_{SiO_2}	SiO_2	2, 960	12	3. 25
			45	3	5. 25
比較例 9	W_{SiO_2}	CeO_2	3, 826	60	3. 50
			1, 205	15	3. 45

Instead of $2\text{O}_3/\text{SiO}_2$ of aluminum complex, except for having used the metallic-oxide distribution liquid of other components as follows, the slurry was manufactured by the same method as an example 4, and the polish performance was evaluated in ten to example of comparison 12 example 4.

[0025]

試験\項目	被研磨膜質	金属酸化物分散液	研磨速度(Å/min)	μ -スクラッチ発生(個)	W I W N U (%)
比較例 10	Cu_{SiO_2}	Al_2O_3	4, 360	370	3. 45
			350	240	5. 10
比較例 11	Cu_{SiO_2}	SiO_2	3, 960	35	4. 25
			275	10	4. 20
比較例 12	Cu_{SiO_2}	CeO_2	4, 844	56	3. 23
			1, 250	35	3. 45

[0026]

[Effect of the Invention] As explained above, since the constituent for polish of this invention is excellent in polish speed and does not produce mu-scratch on the surface of a wafer after polish, it fits flattening processing of the device wafer front face in semiconductor industry.

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CLAIMS

[Claim(s)]

[Claim 1] The constituent for polish characterized by consisting of the metallic-oxide impalpable powders, the deionized water, and the additives which used $2\text{O}_3/\text{SiO}_2$ of aluminum complex as the indispensable component.

[Claim 2] The $2\text{O}_3/\text{SiO}_2$ complex impalpable powder of aforementioned [aluminum] is a constituent for polish according to claim 1 which uses AlCl_3 and SiCl_4 as a raw material, and is characterized by being manufactured by the Co-Fumed method.

[Claim 3] For $67**15\text{wt\%}$ and SiO_2 content, the content of aluminum 2O_3 is [the $2\text{O}_3/\text{SiO}_2$ complex impalpable powder of aforementioned / aluminum] the constituent for polish according to claim 1 with which it is characterized by being $33**15\text{wt\%}$.

[Claim 4] The aforementioned aluminum 2O_3 / SiO_2 complex impalpable powder are a constituent for polish according to claim 1 characterized by being the range whose specific surface area is $20\text{-}200\text{m}^2/\text{g}$.

[Claim 5] The grain size of $2\text{O}_3/\text{SiO}_2$ of aforementioned [aluminum] complex is a constituent for polish according to claim 1 characterized by being $10\text{-}500\text{nm}$ in the state of distribution.

[Claim 6] The constituent for polish according to claim 1 characterized by the content of the $2\text{O}_3/\text{SiO}_2$ complex impalpable powder of aforementioned [aluminum] being 1 - 50 % of the weight.

[Claim 7] the aforementioned metallic-oxide impalpable powder -- aluminum $2\text{O}_3/\text{SiO}$ -- the constituent for polish according to claim 1 characterized by mixing one or more sorts chosen from the group which is independent 2 complex or was constituted from a silica, an alumina, Seria, a zirconia, a titania, etc. by this

→ [Claim 8] The aforementioned additive KOH , NH_4OH , R_4NOH , H_3PO_4 , CH_3COOH , HCl , HF , H_2O_2 , KIO_3 and HNO_3 , H_3PO_4 , $\text{K}_2\text{Fe}(\text{CN})_6$, $\text{Na}_2\text{Cr}_2\text{O}_7$, KCl , $\text{Fe}(\text{NO}_3)_2$ and NH_2 -- the constituent for polish according to claim 1 characterized by being one or more sorts chosen from OH , DMSO, oxalic acid, a malonic acid, a succinic acid, a potassium hydrogen phthalate, 2-pyrrolidine one, etc.

[Claim 9] The constituent for chemical mechanical polish of the semiconductor device characterized by being formed from 1 - 50 % of the weight of metallic-oxide impalpable powders, 40 - 98 % of the weight of deionized water, and 1 - 10 % of the weight of additives which use $2\text{O}_3/\text{SiO}_2$ of aluminum complex as an indispensable component.

[Claim 10] The constituent for polish according to claim 9 characterized by the aforementioned semiconductor device being the wafer membranous quality which consists of Si , SiO_2 , SiN , W , Ti , TiN , Cu , TaN , etc.

[Claim 11] The constituent for polish according to claim 9 characterized by the aforementioned semiconductor device receiving the chemical mechanical polish process of semiconductor shallow trench isolation (Shallow Trench Isolation).

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PRIOR ART

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[0003] Although the metal layer has a three-tiered structure when structures, such as a microprocessor or RAM, are the three-generation versions of steps multilayer structure, for example, 64DRAMs, between membrane layers is in the state which is not uniform, and when piling up continuously, there is room for the problem on process advance to occur for the complexity on structure. That is, if an incident ray is reflected irregularly by the refracted membranous quality which is not flat at the time of a photograph process, thereby, the problem to which a photoresist pattern does not become exact may occur at the time of development. Therefore, it will be necessary to constitute the structure between these membranous qualities more simply, and a membranous unnecessary growing region is removed and it is made for more membranous quality to pile up efficiently for this reason. The most efficient thing in the flattening process known till present is CMP. Moreover, since the process of the new flattening processes (SOG Etch Back/efficient consumer response Depo & Etch etc.) developed until now is complicated, it receives going on two to 5 step, and a CMP process can merely end a process by polish and washing once. The constituent for polish used for a semiconductor CMP process usually contains the metallic oxide in common, and can divide it roughly into three sorts by the quality of abrasives-ed like [for the object for single-crystal-silicon polish, the object for insulating-layer polish, metal wiring, and plug polish].

[0004] As the metallic oxide used for a semiconductor CMP process The silica manufactured by the fuming method or the sol gel (Sol-Gel) method (SiO₂), An alumina (aluminum 2O₃), Seria (CeO₂), a zirconia (ZrO₂), The titania (TiO₂) etc. is used most widely (USP4,959,113, USP5,354,490, USP5,516,346, and WO 97-40,030). Recently, the constituent which used MANGANIA (Mn 2O₃, EP 816,457), silicon nitride (SiN, EP786,504), etc. is also reported. These methods will express the property which changes in the physical properties and polish performance of a slurry, respectively with kinds of selected metallic oxide about the method which used the metallic oxide in independent, respectively. For example, since the particle itself is soft in a polish performance though it has a comparatively unstable distributed state when applying to acid conditions in the case of the slurry which used the silica, it is mu. - Although it has the advantage which does not make a scratch induce, when applying by the metal slurry, it has the fault that the polish speed to barrier material (Barrier material) is slow. On the other hand, when an alumina is used as a metallic oxide, and the stable distributed state is expressed compared with the silica under acid conditions and it applies by the metal slurry, while there is an advantage with an excellent polish speed to barrier material, the fault which makes many defects, such as mu-scratch, induce is after polish.

[0005] Although the slurry which used metallic oxides, such as Seria announced recently, a zirconia, a titania, MANGANIA, and silicon nitride, expresses the result improved how much in respect of physical properties and a polish performance, the commercial manufacturing process of these metallic oxides has not turned stably [**] yet, and the expensive point is pointed out as a fault compared with the silica and the alumina also in the price.

[0006] Moreover, the method of improving a polish performance is also learned for two or more sorts using the aforementioned metallic oxide, mixing. For example, there are a method (USP 5,084,071) of raising polish repeatability, the method (WO 97/13889) of making an alumina (alpha type) the main abrasive material, and carrying out proper quantity addition of the soft metallic oxide more relatively than an alumina, etc. by making a silica into the main abrasive material and carrying out little addition of the aluminum 2O₃. Although the result improved with polish speed, polish selectivity, etc. from the case where the slurry manufactured by these mixture method uses a single metallic oxide is expressed, it can be said that the room of an improvement remains. For example, since these particles exist with the only mixed form when adding a small amount of silica to the slurry which made the alumina (alpha type) the main abrasive material, the distributed stability of a slurry falls and the precipitation (Sedimentation) reduction by the solidification (Coagulation) between particles etc. takes place during storage.

[0007]

[Translation done.]

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(54)【発明の名称】 研磨用組成物

(57)【要約】

【課題】 優秀な研磨性能を有し、半導体デバイスウェーハ表面の平坦化加工に適した、 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体微粉末を主成分とした研磨用組成物を提供することである。

【解決手段】 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体を必須成分とする金属酸化物微粉末、脱イオン水及び添加剤から組成される。

【特許請求の範囲】

【請求項1】 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体を必須成分とした金属酸化物微粉末、脱イオン水及び添加剤から構成されたことを特徴とする研磨用組成物。

【請求項2】 前記 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体微粉末は、 AlCl_3 と SiCl_4 を原料とし、Co-Fumed法により製造されることを特徴とする請求項1記載の研磨用組成物。

【請求項3】 前記 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体微粉末は、 Al_2O_3 の含量が $67 \pm 15\text{wt\%}$ 、 SiO_2 含量が $33 \pm 15\text{wt\%}$ であることを特徴とする請求項1記載の研磨用組成物。

【請求項4】 前記 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体微粉末は、比表面積が $20 \sim 200\text{m}^2/\text{g}$ の範囲であることを特徴とする請求項1記載の研磨用組成物。

【請求項5】 前記 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体の粒子サイズは、分散状態で $10 \sim 500\text{nm}$ であることを特徴とする請求項1記載の研磨用組成物。

【請求項6】 前記 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体微粉末の含量が $1 \sim 50\text{重量\%}$ であることを特徴とする請求項1記載の研磨用組成物。

【請求項7】 前記金属酸化物微粉末は $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体単独であるか、又は、これに、シリカ、アルミナ、セリア、ジルコニア、チタニアなどから構成された群から選択された1種以上を混合したものであることを特徴とする請求項1記載の研磨用組成物。

【請求項8】 前記添加剤は、 KOH 、 NH_4OH 、 R_4NOH 、 H_3PO_4 、 CH_3COOH 、 HC1 、 HF 、 H_2O_2 、 KIO_3 、 HNO_3 、 H_3PO_4 、 $\text{K}_2\text{Fe}(\text{CN})_6$ 、 $\text{Na}_2\text{Cr}_2\text{O}_7$ 、 KOC1 、 $\text{Fe}(\text{NO}_3)_2$ 、 NH_2OH 、 DMSO 、蔴酸、マロン酸、コハク酸、ボタシウムハイドロジエンフタラート、2-ヒドロジンワンなどから選択される1種以上であることを特徴とする請求項1記載の研磨用組成物。

【請求項9】 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体を必須成分とする金属酸化物微粉末 $1 \sim 50\text{重量\%}$ 、脱イオン水 $40 \sim 98\text{重量\%}$ 及び添加剤 $1 \sim 10\text{重量\%}$ から構成されたことを特徴とする半導体デバイスの化学的機械的研磨用組成物。

【請求項10】 前記半導体デバイスが、 Si 、 SiO_2 、 SiN 、 W 、 Ti 、 TiN 、 Cu 、 TaN などからなるウェーハ膜質であることを特徴とする請求項9記載の研磨用組成物。

【請求項11】 前記半導体デバイスが半導体シャロートレンチアイソレイション(Shallow Trench Isolation)の化学的機械的研磨工程を受けることを特徴とする請求項9記載の研磨用組成物。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は研磨用組成物、より

50 4)などを使用した組成物も報告されている。これら方

詳しく述べては $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体を必須成分とする金属酸化物微粉末、脱イオン水及び添加剤から構成された半導体デバイスの化学的機械的研磨組成物に関するものである。

【0002】

【従来の技術】 近年、集積回路(IC)の集積度が増大するにしたがって、ウェーハのグローバル(Global)平坦化の重要性が段々大きくなっています。このような新たな平坦化技術として注目を浴び始めたものが化学的機械的研磨(Chemical Mechanical Polishing; CMP)である。高集積半導体素子は、導体材料と絶縁体材料を繰り返し蒸着させバターンを形成させることにより、製作される。バターンを形成させると、表面が平坦化されなければ、新たなバターン層を形成させるに多くの困難を受けることになる。集積度が増加するにしたがって、フィーチャーサイズ(Feature Size)の極小化及び多層接続(Multilevel Interconnection)が必要であり、このための最小条件の一つがグローバル平坦化である。

【0003】 マイクロプロセッサ又はRAMなどの構造が段々多層構造、例えば64DRAMの3世代バージョンの場合、メタル層が3層構造になっているが、膜層の間が均一でない状態で、統一して積もっていく場合、構造上の複雑性のため、工程進行上の問題が発生する余地がある。すなわち、フォト工程時、平坦でない屈折した膜質により入射光線が乱反射されると、これにより、現像時、フォトレジストバターンが正確にならない問題が発生し得る。したがって、これら膜質間の構造をより単純に構成する必要が生じ、このため、膜質の不要な成長部を除去して、より多くの膜質が効率的に積もるようにするものである。今まで知られた平坦化工程のなかで最も能率的なものはCMPである。また、これまで開発された新たな平坦化工程(SOG Etch Back/ECR Depo & Etchなど)は、その工程が複雑であるため、2~5ステップを進行するに対し、CMP工程はただ一度の研磨及び洗浄により工程が終了できる。半導体CMP工程に使用される研磨用組成物は、通常金属酸化物を共通に含んでおり、被研磨材質によって、単結晶シリコン研磨用、絶縁層研磨用、金属配線及びプラグ研磨用のように、3種に大別できる。

【0004】 半導体CMP工程に使用される金属酸化物としては、発煙法又はソルゲル(Sol-Gel)法で製造されたシリカ(SiO_2)、アルミナ(Al_2O_3)、セリア(CeO_2)、ジルコニア(ZrO_2)、チタニア(TiO_2)などが最も広く使用されており(USP 4, 959, 113, USP 5, 354, 490, USP 5, 516, 346, WO 97-40, 030)、最近にはマンガニア(Mn_2O_3)、EP 816, 457)、シリコンニトリド(SiN)、EP 786, 50

法は金属酸化物をそれぞれ独立的に使用した方法に関するもので、選択された金属酸化物の種類によってスラリーの物性及び研磨性能においてそれぞれ異なる特性を表すことになる。例えば、シリカを使用したスラリーの場合、酸性の条件に適用するとき、比較的不安定な分散状態を有しながらも、研磨性能においては、粒子自体がソフトであるので、 μ -スクラッチを誘発させない利点を有するが、メタルスラリーで適用するときは、バリア材(Barrier material)に対する研磨速度が遅いという欠点を有する。これに対し、アルミナを金属酸化物として使用した場合には、酸性条件下のシリカに比べ、安定した分散状態を表し、メタルスラリーで適用するときは、バリア材に対する研磨速度が優秀である利点がある反面、研磨後に μ -スクラッチなどの欠陥を多く誘発させる欠点がある。

【0005】最近に発表されているセリア、ジルコニア、チタニア、マンガニア、シリコンニトリドなどの金属酸化物を使用したスラリーは物性及び研磨性能の面でどのくらい改善された結果を表すが、これら金属酸化物の商業的製造工程がまたは安定化されていなく、価格においてもシリカ及びアルミナに比べて高価である点が欠点として指摘されている。

【0006】また、前記金属酸化物を2種以上混合して使用することで、研磨性能を改善する方法も知られている。例えば、シリカを主研磨剤とし Al_2O_3 を少量添加することにより、研磨再現性を高める方法(USP 5,084,071)と、アルミナ(α 型)を主研磨剤としアルミナより相対的にソフトな金属酸化物を適量添加する方法(WO 97/13889)などがある。これら混合方法により製造されたスラリーは単一金属酸化物を使用する場合より研磨速度及び研磨選択性などで改良された結果を表すが、改善の余地が残っているといえる。例えば、アルミナ(α 型)を主研磨剤としたスラリーに少量のシリカを添加する場合は、これら粒子が単に混合された形態で存在するため、スラリーの分散安定性が低下して、貯蔵中に粒子間の凝固(Coagulation)などによる沈殿(Sedimentation)減少などが起こる。

【0007】

* 【発明が解決しようとする課題】本発明者らは前記のような従来の問題点を改良し、優秀な研磨組成物を得るために研究開発を繰り返した結果、本発明を成案することになった。すなわち、本発明者らは新規の $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体微粉末を主成分とした研磨用組成物が優秀な研磨性能を有するという事実を見つけて本発明を完成することになった。

【0008】

【課題を解決するための手段】本発明の旨は、脱イオン水に $\text{Al}_2\text{O}_3/\text{SiO}_2$ 微粉末が含有されたことを特徴とする研磨組成物に関するもので、このような組成物を半導体ウェーハの研磨に適用すると、研磨速度に優れ、被研磨膜質の種類による研磨選択性に優れ、研磨後に研磨表面に μ -スクラッチなどの欠陥を生じないなどの特性があるので、高集積デバイスの製造に適用することができる。

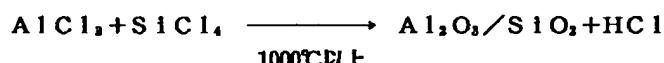
【0009】

【発明の実施の形態】本発明は半導体、フォトマスク、ガラスディスク及び合成樹脂など、各種工業製品の研磨に使用される研磨組成物に関するもので、特に半導体産業において、デバイスウェーハの表面平坦化加工に適した研磨組成物に関するものである。より詳しくは、半導体デバイスの製造時、CMP技術が適用されている単結晶シリコン、層間絶縁膜、金属配線及びプラグ、バリア材などの研磨用スラリーの組成物に関するもので、既存の研磨組成物に比べ、研磨速度に優れ、それぞれの被研磨膜質に対する研磨選択性に優れ、かつ、研磨後にウェーハの表面に μ -スクラッチを生じないので、高集積デバイス形成技術に適用できる研磨用組成物を提供するものである。すなわち、 $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体を必須成分とする金属酸化物微粉末、脱イオン水及び添加剤から組成された研磨用組成物、特に半導体デバイスの化学的機械的研磨用組成物を提供することである。

【0010】本発明に特徴的に使用される金属酸化物は $\text{Al}_2\text{O}_3/\text{SiO}_2$ の複合体で、下記のように AlCl_3 及び SiCl_4 を原料として使用するCo-Fumed法により製造されるものである。

【0011】

*
Air



このように製造された $\text{Al}_2\text{O}_3/\text{SiO}_2$ は Al_2O_3 と SiO_2 の単純混合形態でない複合体で、各成分が単純混合された場合とは全く異なる独特な物性を表す。下記の表にDegussa(ドイツ)で試製品で製造した*

※ “VP MOX 90”を基準にして $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体の物性を整理した。△ $\text{Al}_2\text{O}_3/\text{SiO}_2$ 複合体の物性(Degussa(ドイツ)の試製品VP MOX 90基準)

【0012】

比表面積 (B E T)	1 0 0 ± 2 5 m ² /g
p H	> 3. 8
Isoelectric Point	6 ~ 7
A l ₂ O ₃ 含量	6 7 ± 1 5 wt%
S i O ₂ 含量	3 3 ± 1 5 wt%
容積密度 (Bulk density)	6 0 ~ 1 0 0 g/l
塩素含量	< 0. 5 wt%

主成分であるA l₂O₃/S i O₂の含量は投入する原料の量及び反応条件を変化させることで調節することができ、一般的なC o - F u m e d法によってはA l₂O₃の含量が6 7 ± 1 5 wt%、S i O₂含量が3 3 ± 1 5 wt%の範囲のものが合成され、この範囲のものが本発明に好ましいものである。

【0013】本発明において、A l₂O₃/S i O₂複合体を研磨用組成物として使用するための分散液を用意する方法は、ダイノミル又はボールミルで高速攪拌する方法及び高剪断 (High Shear) ミキサーを使用する方法など、既存の分散方法のいずれかでも使用できるが、本発明者により新たに開発されて特許出願されたマイクロフリューダイザ (Microfluidizer) の原理を用いる方法 (韓国特許出願K R - 9 8 - 3 9 2 1 2) を使用する場合より効果的に遂行できる。

【0014】本発明において、研磨用分散液として使用するためのA l₂O₃/S i O₂の1次粒子サイズは1 0 ~ 1 0 0 nm、好ましくは2 0 ~ 6 0 nmである (B E T測定の結果)。1次粒子が1 0 nm以下と小さすぎると、研磨速度 (Removal Rate) が低下するため、生産性の側面で好ましくなく、逆に1 0 0 nm以上と大きすぎると、研磨速度が増加するため、生産性の側面では有利であるが、分散に困難があり、大型粒子が多量存在してムースクラッチを多量誘発するため、好ましくない。これら分散液は、分散状態での2次平均粒子が1 0 ~ 5 0 0 nmであるものが好ましく、5 0 0 nm以上の粒子を多量含有すると分散安定性が低下して、1週日以上室温で放置すると沈降が起こるため、C M P工程の使用前に攪拌工程が更に必要とされるので、好ましくない。一方、本発明において、研磨用分散液として使用するためのA l₂O₃/S i O₂複合体の粒子大きさは比表面積 (Specific Surface Area : B E T測定) で表記でき、好ましくは2 0 ~ 2 0 0 m²/mの範囲である。本発明において、主研磨剤であるA l₂O₃/S i O₂複合体の固形物濃度は、通常組成物全量に対して1 ~ 5 0 重量%、好ましくは1 ~ 2 5 重量%である。固形物濃度が1 重量%未満である場合は、本発明の効果が期待できない。このような範囲内で、被研磨膜質の性質によって好ましい範囲がもっと限定されるが、通常、A l₂O₃/S i O₂複合体を研磨剤とした組成物を半導体デバイス製造時のC M P工程のス*

* ラリーとして適用する場合の適正濃度は、被研磨剤が単結晶シリコンである場合1 ~ 5 重量%、層間絶縁膜は5 ~ 1 5 重量%、金属配線/アラグ/バリア材などの金属膜は3 ~ 7 重量%であることが更に好ましい。

【0015】本発明において、研磨用分散液は、被研磨膜質の材質によって種々の添加剤を添加して使用する。例えば、単結晶シリコン及び層間絶縁膜研磨用に使用するときはK OHなどの塩基を添加して使用し、W又はC uなどの金属膜質及びT i / T i N、T a / T a Nなどのバリア材研磨用に使用するときは酸化剤又はそのほかの添加剤を添加して使用する。本発明に使用できる塩基の種類はK OH、NH₄OH、R₄NOHなどであり、酸の種類はH₃PO₄、CH₃COOH、HCl、HFなどである。酸化剤はH₂O₂、K IO₃、HNO₃、H₃PO₄、K₂Fe (CN)₆、Na₂Cr₂O₇、KOC₁、Fe (NO₃)₂、NH₂OH、DMSOなどであり、そのほかの添加剤としては、磷酸、マロン酸、コハク酸などの2価酸と金属膜質間の研磨選択性を高めるためのボタシウムハイドロジェンフタラート (Potassium Hydrogen Phthalate)、保湿性を付与して集合及び凝集を防止する2-ピロリジンワンなどがあり、これら添加剤は単独又は混合で使用できる。これらの添加順序は特定されるものではなく、A l₂O₃/S i O₂複合体を脱イオン水に分散前及び分散後のいずれかに添加することができる。これら添加剤投与量は、前述したように、A l₂O₃/S i O₂複合体1 ~ 5 重量%、より好ましくは1 ~ 1 0 重量%であり、よって脱イオン水の含量は残余量で4 0 ~ 9 8 重量%である。

【0016】本発明は新規のA l₂O₃/S i O₂複合体微粉末を使用した研磨用組成物に関するもので、本発明により製造された研磨用組成物を半導体ウェーハの研磨に適用すると、研磨速度が優秀であり、研磨後、研磨表面にムースクラッチ結果を起こさない特性を有し、特に、層間絶縁膜 (S i O₂) に対する研磨選択性が優秀であるので、シャロートレンチアイソレイション (Shallow Trench Isolation) 工程に適したなど、高集積デバイスの製造時に有用に適用し得る特徴がある。

【0017】以下、実施例に基づいて本発明を具体的に説明する。下記の実施例は例示的意味を有し、本発明の保護範囲を制限するものではない。

【実施例】

<Al₂O₃/SiO₂複合体分散液の製造> Al₂O₃/SiO₂複合体パウダー (VP MOX 90, Degussa社製) 1. 3kg及び脱イオン水8.6kgの混合物を20Lのポリエチレン容器に入れ、1000rpmで2時間プレミックス (Premix) させた後、高圧分散装置を用いて、圧力脈動が18,000±1,800psiの範囲に維持されるようにした後、1回通過させて分散させた。分散されたサンプルは、5μmデプスフィルタ (Depth filter) で済過させた後、粒度分析器 (Zetasizer, Malvern社製) を用いて粒子分布及び平均大きさを測定した結果、粒子分布は10~400nmであり、平均大きさは180nmであった。

実施例1

前記用意したAl₂O₃/SiO₂複合体分散液5Lに20%KOH溶液を適宜添加してpHを11.0に調整したものを作り、6インチウェーハ単結晶シリコン

を被研磨膜質として、下記のような研磨条件下で2分間研磨したあと、研磨により除去された厚さの変化から、研磨速度及びWithin Wafer Non-Uniformity (WIWNU) を測定し、KLA (TENCOR社製) 機器を用いてμ-スクラッチの発生数を測定した。

<研磨条件>

○研磨機 Model: 6EC (STRASBAUGH社製)

○研磨条件:

10 - パッドタイプ: IC1000/SubaIV Stacked (Rodel社製)

- プラテン速度: 90 rpm

- クイル (Quill) 速度: 30 rpm

- 圧力: 8 psi

- 背圧 (Back Pressure): 0 psi

- 温度: 25°C

- スラリー流量: 150 ml/min

○研磨結果:

【0018】

項目 \ 被研磨膜質	Si
研磨速度 (Å/min)	4,250
μ-スクラッチ発生 (個)	2
WIWNU (%)	2.30

* WIWNU = (標準偏差/平均研磨速度) × 100

※これを使用したことを除き、実施例1と同方法で研磨性能を評価した。

実施例2

実施例1において、被研磨膜質として、単結晶シリコンの代わりに層間絶縁膜 (SiO₂) 及びSiNをそれぞれ

○研磨結果

【0019】

項目 \ 被研磨膜質	SiO ₂	SiN
研磨速度 (Å/min)	5,775	345
μ-スクラッチ発生 (個)	0	0
WIWNU (%)	2.45	3.21

実施例3

前記Al₂O₃/SiO₂複合体分散液5Lに脱イオン水5Lを更に添加して、固体物濃度を6.5重量%に調整した後、酸化剤として50%H₂O₂を0.4L添加した後、H₂SO₄及びHNO₃を添加して、pHを3に調

★整した。W及びSiO₂が塗布されたそれぞれの6インチウェーハを被研磨膜質とし、実施例1の方法で研磨性能を評価した。

○研磨結果

【0020】

項目 \ 被研磨膜質	W	SiO ₂
研磨速度 (Å/min)	3,450	24
μ-スクラッチ発生 (個)	1	0
WIWNU (%)	3.45	2.3

実施例4

前記Al₂O₃/SiO₂複合体分散液5Lに脱イオン水5Lを更に添加して固体物濃度を6.5重量%に調整した後、酸化剤として50%H₂O₂を0.4L添加した後、H₂SO₄、HNO₃及びアンモニアを使用してpH

★を6.5に調整した。Cu及びSiO₂が塗布されたそれぞれの6インチウェーハを被研磨膜質として実施例1の方法で研磨性能を評価した。

○研磨結果

【0021】

項目＼被研磨膜質	Cu	SiO ₂
研磨速度 (Å/min)	4, 370	12
μ-スクラッチ発生 (個)	0	0
W I W N U (%)	2. 35	2. 10

比較例1～3

実施例1において、Al₂O₃／SiO₂複合体分散液の代わりに、下記のように単一金属酸化物を使用し同一方法で分散液を製造して使用したことを除き、実施例1と同一方法でスラリーを製造し研磨性能を評価した。○A

Al₂O₃分散液：粒子分布；10～720nm、平均；255nm

* ○SiO₂分散液：粒子分布；10～400nm、平均；175nm

○CeO₂分散液：粒子分布；10～1100nm、平均；450nm

○研磨結果

【0022】

*

試験＼項目	金属酸化物分散液	研磨速度 (Å/min)	μ-スクラッチ発生 (個)	W I W N U (%)
比較例1	Al ₂ O ₃	3, 500	280	5. 85
比較例2	SiO ₂	1, 340	16	5. 10
比較例3	CeO ₂	5, 150	35	5. 00

比較例4～6

実施例2において、Al₂O₃／SiO₂複合体分散液の代わりに、つぎのようにほかの成分の金属酸化物分散液※

※を使用したことを除き、実施例2と同一方法でスラリー

を製造して研磨性能を評価した。

【0023】

試験＼項目	被研磨膜質	金属酸化物分散液	研磨速度 (Å/min)	μ-スクラッチ発生 (個)	W I W N U (%)
比較例4	SiO ₂ SiN	Al ₂ O ₃	5, 315	370	4. 45
			1, 105	12	4. 50
比較例5	SiO ₂ SiN	SiO ₂	3, 980	39	3. 90
			870	8	4. 00
比較例6	SiO ₂ SiN	CeO ₂	6, 263	87	4. 35
			410	5	4. 10

比較例7～9

実施例3において、Al₂O₃／SiO₂複合体分散液の代わりに、つぎのようにほかの成分の金属酸化物分散液★

★を使用したことを除き、実施例3と同一方法でスラリー

を製造して研磨性能を評価した。

【0024】

試験＼項目	被研磨膜質	金属酸化物分散液	研磨速度 (Å/min)	μ-スクラッチ発生 (個)	W I W N U (%)
比較例7	W SiO ₂	Al ₂ O ₃	3, 104	178	4. 55
			650	58	3. 45
比較例8	W SiO ₂	SiO ₂	2, 960	12	3. 25
			45	3	5. 25
比較例9	W SiO ₂	CeO ₂	3, 826	60	3. 50
			1, 205	15	3. 45

比較例10～12

実施例4において、Al₂O₃／SiO₂複合体の代わりに、つぎのようにほかの成分の金属酸化物分散液を使用

☆に、つぎのようにほかの成分の金属酸化物分散液を使用

したことを除き、実施例4と同一方法でスラリーを製造

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12

して研磨性能を評価した。

* * 【0025】

試験\項目	被研磨膜質	金属酸化物 分散液	研磨速度 (Å/min)	μ-スクラッチ 発生(個)	WIWNU (%)
比較例10	Cu	Al ₂ O ₃	4, 360	370	3. 45
	SiO ₂		350	240	5. 10
比較例11	Cu	SiO ₂	3, 960	35	4. 25
	SiO ₂		275	10	4. 20
比較例12	Cu	CeO ₂	4, 844	56	3. 23
	SiO ₂		1, 250	35	3. 45

【0026】

※スクラッチを生じないので、半導体産業におけるデバイスウェーハ表面の平坦化加工に適する。

【発明の効果】以上説明したように、本発明の研磨用組成物は、研磨速度に優れ、研磨後にウェーハの表面にμ※

フロントページの続き

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